

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of)
Michael MAIER et al.) Group Art Unit: Unassigned
Application No.: Unassigned) Examiner: Unassigned
Filed: March 5, 2002)
For: PROCESS AND APPARATUS FOR)
THE DIGITAL PRODUCTION OF A)
PICTURE)
)

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to examination of the above-identified patent application, kindly enter the following amendment.

IN THE ABSTRACT:

Please delete the Abstract, and substitute the new Abstract set forth on the attached page hereto.

IN THE SPECIFICATION:

Kindly replace the paragraph beginning at page 1, line 6 with the following:

The invention relates to a process and apparatus for the digital production of a picture from an original image, which is present in electronic form, by pixel-by-pixel

recording from the original image information of the original image onto a sheet type picture carrier.

Kindly replace the paragraph beginning at page 1, line 11, with the following:

Digital image reproducing apparatus for reproducing on a photographic basis, so called digital photographic printers, produce pictures or copies by exposing the image information from the original image which is present in electronic format, onto a photosensitive copier material. One possibility is the optical reproduction of the image information of the original image by a suitable electro-optical converter device operating pixel-by-pixel, thereby producing an optical representation of the original image, and projecting this optical representation of the original image onto the copier material for exposure thereonto. Suitable electro-optical converter devices are thereby active (self-illuminated) as well as passive (modulating) electro-optical arrangements; typical examples being cathode ray tubes, liquid crystal cell arrays operating in transmission or reflection, light emitting diode cell arrays, electro-luminescence cell arrays, and lately also so-called digital micro mirror arrays.

Kindly replace the paragraph beginning at page 3, line 15, with the following:

The above objects and features of the present invention will be more apparent from the following description of the preferred embodiments with reference to the accompanying drawings, wherein:

Kindly replace the line beginning at page 3, line 24, with the following:

Detailed Description of the Preferred Embodiments

Kindly replace the paragraph beginning at page 5, line 21, with the following:

So far, the apparatus completely corresponds in construction and function to the apparatus described, for example, in EP-A-0 986 243, which is hereby incorporated by reference in its entirety, and therefore does not need to be further described.

Kindly replace the paragraph beginning at page 7, line 12, with the following:

Scanning devices of the type used herein as well as their electrical control are generally known, for example, from scanners operating line by line or from office copier apparatus or also from the DE-A19858968 (priority US 006565 of January 14, 1998), which is hereby incorporated by reference in its entirety, so that the person skilled in the art does not need any further explanation in relation thereto. For the comprehension of the present invention it is simply important to remember that the signal produced by a single converter element clearly differs depending on whether or not paper P is located under the converter element. Thus, a limit edge of the paper P can be recognized on the basis of the signal level difference between neighboring converter elements, and its position (in longitudinal direction of the converter arrangement) can be determined. The position is thereby measured in pixel units of the converter arrangement, which means at the resolution of the converter arrangement. Since the scanning device 21 is in a fixed spatial relation to the

paper platform 10, the position (measured in longitudinal direction of the converter arrangement) of a recognized paper edge relative to the paper platform 10 is known.

Kindly add a paragraph beginning on page 11, line 20, with the following:

It would be appreciated by those skilled in the art that the present invention can be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The presently disclosed embodiments are therefore considered in all respects to be illustrative and not restricted. The scope of the invention is indicated by the appended claims rather than the foregoing description and all changes that come within the meaning and range of equivalence thereof are intended to be embraced therein.

IN THE CLAIMS:

Kindly replace claims 1 - 21 as follows:

1. A process for the production of a picture from an original image, which is present in electronic form, by pixel-by-pixel recording of digital image data from the original image onto a sheet type picture carrier, which is transported in a transport direction onto a recording platform and positioned thereon, comprising:

measuring the size and relative position of the picture carrier on the recording platform; and

carrying out a position and size correction of the digital image data based on measured data obtained by the measuring of the picture carrier, for recording corrected digital image data onto the sheet type picture carrier.

2. The process according to claim 1, comprising:

recording of the corrected digital image data with a projection or imaging optics by exposure of the picture carrier;

determining transverse positioning errors of the picture carrier transverse to the transport direction of the picture carrier relative to a nominal position on the recording platform; and

a shifting an image by the transverse positioning error through corresponding local adjustment of at least parts of the projection of imaging optics.

3. The process according to claim 2, comprising:

determining a width of the picture carrier as measured transverse to the transport direction; and

adapting size of the digital image data to a width of the picture carrier by corresponding adjustment of at least parts of the projection or imaging optics.

4. The process according to claim 1, comprising:

transforming the digital image data into transformed image data by recalculation for the position and size correction determined during measuring of the picture carrier; and

recording the transformed image data onto the picture carrier.

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5. The process according to claim 4, comprising:

determining a transverse positioning error of the picture carrier transverse to the transport direction of the picture carrier relative to a nominal position on the recording platform; and

carrying out an image shift corresponding to the transverse positioning error.

6. The process according to claim 4, comprising:

determining a width of the picture carrier as measured transverse to the transport direction, and adapting image size to the width of the picture carrier during transforming of the digital image data.

7. The process according to claim 4, comprising:

determining longitudinal positioning error of the picture carrier parallel to the transport direction of the picture carrier relative to a nominal position on the recording platform; and

carrying out an image shift corresponding to the longitudinal positioning error during the transforming of the digital image data.

8. The process according to claim 4, comprising:

determining length of the picture carrier measured parallel to the transport direction; and

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carrying out an adaptation of image size to the length of the picture carrier.

9. The process according to claim 4, comprising:

determining an angle of rotation of the picture carrier relative to a nominal angular position on the recording platform; and
carrying out an image rotation by the angle of rotation during the transforming of the digital image data.

10. The process according to claim 4, wherein the measuring of the picture carrier is carried out by way of a photoelectric scanning device positioned at the recording platform or adjacent thereto.

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11. An apparatus for the production of a picture from an original image, which is present in electronic form, by pixel-by-pixel recording of digital image data from the original image onto a sheet type picture carrier comprising:

a memory for storage of the digital image data of the original image;

a recording platform on which the picture carrier can be positioned in a recording position;

transport means for transporting the picture carrier on the recording platform in a transport direction;

a digital recording device for recording the digital image data from the original image onto the picture carrier positioned on the recording platform;

a photoelectric scanning device for the picture carrier located adjacent to the recording platform;

a position processor in communication with the scanning device, wherein the scanning device and the position processor are configured for measuring size and relative position of the picture carrier on the recording platform and for calculating position and size based on measured data; and

a control in communication with the position processor for carrying out a position and size correction based on the measured data obtained during the measuring of the picture carrier, for recording corrected digital image data onto the picture carrier.

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12. The apparatus according to claim 11, comprising:

a projection or imaging optics for recording the corrected digital image data by exposure, whereby the position processor is configured for determining a transverse positioning error of the picture carrier transverse to the transport direction and relative to a nominal position on the recording platform, and the control is configured for carrying out an image shift corresponding to the transverse positioning error by corresponding adjustment of at least parts of the projection or imaging optics.

13. The apparatus according to claim 12, the position processor being configured for determining from scanning signals produced by the scanning device a width of the picture carrier as measured transverse to the transport direction of the picture carrier and for adapting image size to the width of the picture carrier by a corresponding adjustment of at least parts of projection or imaging optics.

14. The apparatus according to claim 11, wherein the control is configured for transforming the digital image data prior to recording on the picture carrier according to the position and size correction.

15. The apparatus according to claim 11, wherein the scanning device is positioned in a transport path of the picture carrier on the recording platform and extends transverse to the recording platform.

16. The apparatus according to claim 15, the scanning device comprising:
an illumination arrangement for exposure of the picture carrier with
measuring light;

a linear arrangement of photoelectric converter elements for receiving
measuring light remitted from the picture carrier; and
converting the measuring light remitted from the picture carrier into
electrical signals.

17. The apparatus according to claim 14, wherein the position processor is
configured for determining from scanning signals produced by the scanning device a
transverse positioning error of the picture carrier transverse to the transport direction of the
picture carrier relative to a nominal position on the recording platform, and for carrying out
an image shift corresponding to the transverse positioning error during the transforming of
the digital image data.

18. The apparatus according to claim 14, wherein the position processor is
configured for determining from the scanning signals produced by the scanning device a
longitudinal positioning error of the picture carrier parallel to the transport direction of the
picture carrier relative to a nominal position on the recording platform, and for carrying out
an image shift corresponding to the longitudinal positioning error during transforming of
the digital image data.

20. The apparatus according to claim 14, wherein the position processor is configured for determining from the scanning signals produced by the scanning device length of the picture carrier as measured parallel to the transport direction, and for carrying out an adaptation of image size to the length of the picture carrier.

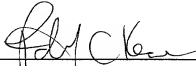
21. The apparatus according to claim 14, wherein the position processor is configured for determining from the scanning signals produced by the scanning device an angle of rotation of the picture carrier relative to a nominal angular position on the recording platform, and for carrying out an image rotation by the angle of rotation during the transforming of the digital image data.

REMARKS

Claims 1 - 21 are pending in the application. The amendments were made to place the application in a more suitable form prior to examination. Favorable consideration is respectfully requested.

Respectfully submitted,

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Page 1, Paragraph beginning at line 6.

The invention relates to a process and apparatus for the digital production of a picture from an original image, which is present in electronic form, by pixel-by-pixel recording [of] from the original image information of the original image onto a sheet type picture carrier.

Page 1, Paragraph Beginning at Line 11.

Digital image reproducing apparatus for reproducing on a photographic basis, so called digital photographic printers, produce pictures or copies by exposing the image information [of] from the original image which is present in electronic format, onto a photosensitive copier material. One possibility is the optical reproduction of the image information of the original image by a suitable electro-optical converter device operating pixel-by-pixel, thereby producing an optical representation of the original image, and projecting this optical representation of the original image onto the copier material for exposure thereonto. Suitable electro-optical converter devices are thereby active (self-illuminated) as well as passive (modulating) electro-optical arrangements; typical examples being cathode ray tubes, liquid crystal cell arrays operating in transmission or reflection, light emitting diode cell arrays, electro-luminescence cell arrays, and lately also so-called digital micro mirror arrays.

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Page 3, Beginning at Line 15.

[The invention will now be further described by way of example only and with reference to the accompanying drawing, wherein]

The above objects and features of the present invention will be more apparent from the following description of the preferred embodiments with reference to the accompanying drawings, wherein:

Page 3, Beginning at Line 24.

[Detailed Description of the Preferred Embodiment]

Detailed Description of the Preferred Embodiments

Page 5, Beginning at Line 21.

So far, the apparatus completely corresponds in construction and function to the apparatus described, for example, in EP-A-0 986 243, which is hereby incorporated by reference in its entirety, and therefore does not need to be further described.

Page 7, Beginning at Line 12.

Scanning devices of the type used herein as well as their electrical control are generally known, for example, from scanners operating line by line or from office copier apparatus or also from the DE-A19858968 (priority US 006565 of January 14, 1998), which

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is hereby incorporated by reference in its entirety, so that the person skilled in the art does not need any further explanation in relation thereto. For the comprehension of the present invention it is simply important to remember that the signal produced by a single converter element clearly differs depending on whether or not paper P is located under the converter element. Thus, a limit edge of the paper P can be recognized on the basis of the signal level difference between neighboring converter elements, and its position (in longitudinal direction of the converter arrangement) can be determined. The position is thereby measured in pixel units of the converter arrangement, which means at the resolution of the converter arrangement. Since the scanning device 21 is in a fixed spatial relation to the paper platform 10, the position (measured in longitudinal direction of the converter arrangement) of a recognized paper edge relative to the paper platform 10 is known.

Page 11, Beginning on Line 20.

It will be appreciated by those skilled in the art that the present invention can be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The presently disclosed embodiments are therefore considered in all respects to be illustrative and not restricted. The scope of the invention is indicated by the appended claims rather than the foregoing description and all changes that come within the meaning and range of equivalence thereof are intended to be embraced therein.

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1. [Process] A process for the production of a picture from an original image, which is present in electronic form, by pixel-by-pixel recording of [the] digital image data [of] from the original image onto a sheet type picture carrier, which is transported in a transport direction onto a recording platform and positioned thereon, comprising [the steps of];

measuring the size and relative position of the picture carrier on the recording platform; and

carrying out a position and size correction of the digital image data [on the basis of the] based on measured data obtained by the measuring of the picture carrier, for recording [of the] corrected digital image data [of the original image] onto the sheet type picture carrier.

2. [Process] The process according to claim 1, comprising:

[wherein the] recording of the corrected digital image data [is carried out] with a projection or imaging optics by exposure of the picture carrier[,];

determining transverse positioning errors of the picture carrier transverse to the transport direction of the picture carrier relative to a nominal position on the recording platform [are determined,]; and

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shifting an image [shift] by the transverse positioning error [is carried out]
through corresponding local adjustment of at least parts of the projection or imaging optics.

3. [Process] The process according to claim 2, comprising: [the further steps
of]
determining [the] a width of the picture carrier as measured transverse to the
transport direction; and
[adaptation] adapting size of the [image size] digital image data to [the
determined with] a width of the picture carrier by corresponding adjustment of at
least parts of the projection or imaging optics.

4. [Process] The process according to claim 1, [wherein] comprising:
transforming the digital image data [of the original image are] into
transformed image data by recalculation for the position and size correction [by way of the
measured data] determined during measuring of the picture carrier; and
recording the transformed image data [of the original image are recorded]
onto the picture carrier.

5. [Process] The process according to claim 4, comprising: [the further steps
of]

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determining a transverse positioning error of the picture carrier transverse to the transport direction of the picture carrier relative to a nominal position on the recording platform; and

carrying out an image shift [by the] corresponding to the transverse positioning error.

6. [Process] The process according to claim 4, comprising: [the further steps of]

determining [the] a width of the picture carrier as measured transverse to the transport direction, and adapting [the] image size to the [determined] width of the picture carrier during [transformation] transforming of the digital image data.

7. [Process] The process according to claim 4, [comprising the further steps of] comprising:

determining [the] longitudinal positioning error of the picture carrier parallel to the transport direction of the picture carrier relative to a nominal position on the recording platform; and

carrying out an image shift [by the] corresponding to the longitudinal positioning error during the [transformation] transforming of the digital image data.

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8. [Process] The process according to claim 4, [comprising the further steps of]
comprising:

determining [the] length of the picture carrier measured parallel to the
transport direction; and

carrying out an adaptation of [the] image size to the [determined]
length of the picture carrier.

9. [Process] The process according to claim 4, [comprising the further steps of]
comprising:

determining an angle of rotation of the picture carrier relative to a
nominal angular position on the recording platform; and

carrying out an image rotation by the angle of rotation during the
[transformation] transforming of the digital image data.

10. [Process] The process according to claim 4, wherein the [measurement]
measuring of the picture carrier is carried out by way of a photoelectric scanning device
positioned at the recording platform or [in the immediate vicinity thereof] adjacent thereto.

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11. An apparatus [Apparatus] for the production of a picture from an original image, which is present in electronic form, by pixel-by-pixel recording of [the] digital image data [of] from the original image onto a sheet type picture carrier, comprising:
- a memory for storage of the digital image data of the original image;
 - a recording platform on which the picture carrier can be positioned in a recording position;
 - transport means for transporting the picture carrier on the recording platform in a transport direction;
 - a digital recording device for recording the digital image data [of] from the original image onto the picture carrier positioned on the recording platform;
 - a photoelectric scanning device for the picture carrier located adjacent to the recording platform;
 - a position processor [cooperating] in communication with the scanning device, wherein the scanning device and the position processor [being constructed] are configured for measuring size and relative position of the picture carrier on the recording platform and for [determining corresponding] calculating position and size based on measured data; and
 - a control [cooperating] in communication with the position processor for carrying out a position and size correction [on the basis of] based on the measured data

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obtained during [the] measuring of the picture carrier, for [the] recording [of the] corrected digital image data onto [of the original image] the picture carrier.

12. [Apparatus] The apparatus according to claim 1 1, [further] comprising:

a projection or imaging optics for recording the corrected digital image data by exposure, whereby the position processor is [constructed] configured for determining a transverse positioning error of the picture carrier transverse to [its] the transport direction and relative to a nominal position on the recording platform, and the control is [constructed] configured for carrying out an image shift [by] corresponding to the transverse positioning error by corresponding adjustment of at least parts of the projection or imaging optics.

13. [Apparatus] The apparatus according to claim 12, the position processor being [constructed] configured for determining from scanning signals produced by the scanning device [the] a width of the picture carrier as measured transverse to the transport direction of the picture carrier and for adapting [the] image size to the [determined with] width of the picture carrier by a corresponding adjustment of at least parts of [the] projection or imaging optics.

14. [Apparatus] The apparatus according to claim 11, wherein the control is

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[constructed] configured for transforming [by calculation] the digital image data [of the original image], prior to recording on the picture carrier, according to the [measured data for carrying out a] position and size correction.

15. [Apparatus] The apparatus according to claim 1 1, wherein the scanning device is positioned in [the] a transport path of the picture carrier on the recording platform and extends transverse to the recording platform.

16. [Apparatus] The apparatus according to claim 15, the scanning device comprising;

an illumination arrangement for exposure of the picture carrier with measuring light[.]; [and]

a linear arrangement of photoelectric converter elements for receiving measuring light remitted from the picture carrier; and

converting the measuring light remitted from the picture carrier into electrical signals.

17. [Apparatus] The apparatus according to claim 14, wherein the position processor is [constructed] configured for determining from [the] scanning signals produced by the scanning device a transverse positioning error of the picture carrier transverse to the

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transport direction of the picture carrier relative to a nominal position on the recording platform, and for carrying out an image shift [by] corresponding to the transverse positioning error during [transformation] the transforming of the digital image data [of the original image].

18. [Apparatus] The apparatus according to claim 14, wherein the position processor is [constructed] configured for determining from the scanning signals produced by the scanning device a longitudinal positioning error of the picture carrier parallel to the transport direction of the picture carrier relative to a nominal position on the recording platform, and for carrying out an image shift [by] corresponding to the longitudinal positioning error during [transformation] transforming of the digital image data [of the original image].

19. [Apparatus] The apparatus according to claim 14, wherein the position processor is [constructed] configured for determining from the scanning signals produced by the scanning device [the] a width of the picture carrier as measured transverse to the transport direction, and for carrying out an adaptation of the digital image size to the [determined] width of the picture carrier.

20. [Apparatus] The apparatus according to claim 14, wherein the position

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processor is [constructed] configured for determining from the scanning signals produced by the scanning device the length of the picture carrier as measured parallel to the transport direction, and for carrying out an adaptation of [the] image size to the [determined] length of the picture carrier.

21. [Apparatus] The apparatus according to claim 14, wherein the position processor is [constructed] configured for determining from the scanning signals produced by the scanning device an angle of rotation of the picture carrier relative to a nominal angular position on the recording platform, and for carrying out an image rotation by the angle of rotation during the [transformation] transforming of the digital image data.

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ABSTRACT

A process for the production of a picture from an original image, which is present in electronic form, by pixel-by-pixel recording of digital image data from the original image onto a sheet type picture carrier, which is transported in a transport direction onto a recording platform and positioned thereon, includes measuring the size and relative position of the picture carrier on the recording platform, carrying out a position and size correction of the digital image data based on measured data obtained by the measuring of the picture carrier, for recording corrected digital image data onto the sheet type picture carrier.

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